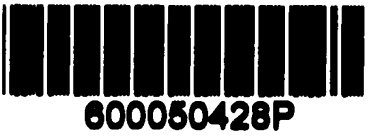
SOME PRACTICAL OBSERVATIONS ON VACCINATION.

W. H. WHITEWAY WILKINSON L.R.C.P.ED.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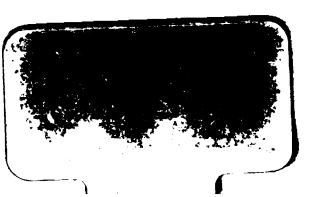


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PRACTICAL OBSERVATIONS

ON

VACCINATION.

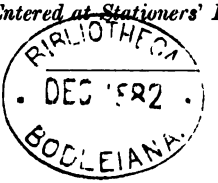
BY

W. H. WHITEWAY WILKINSON, L.R.C.P. Ed.,

ETC.

One of the Public Vaccinators for the Parish of St. Mary, Islington.

Entered at Stationers' Hall.



LONDON:

J. & A. CHURCHILL, NEW BURLINGTON STREET.

1882.

LONDON:
WERTHEIMER, LEA AND CO., PRINTERS,
CIRCUS PLACE, LONDON WALL, E.C.

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PREFACE.

TO THE MEDICAL PROFESSION.

In introducing the following pages to the Medical Profession, and to those of the lay public into whose hands they may fall, I make no pretensions to interfere with the works of those who have written so elaborately upon the subject, but simply set forth the practical deductions I have made from more than twelve years' experience as a Public Vaccinator, and from having vaccinated nearly twenty thousand persons. At a future time I hope to be able to go deeper into the subject, and bring to bear a more extended experience acquired by their

Obedient Servant,

WHITEWAY WILKINSON.

September, 1882.

SOME PRACTICAL OBSERVATIONS ON VACCINATION.

What is Vaccination?

Vaccination is the transferring of a portion of the lymph from the vaccine vesicle, on the eighth day of its growth, from one human being to another, through the medium of the blood circulating in the skin, which if successfully performed results in the formation in eight days of a vesicle similar in all respects to the vesicle from which the lymph was taken, such vesicle formation being attended by more or less constitutional disturbance.

Its Object.

To prevent the individual from being attacked by smallpox, or at least to modify the course of that disease.

The Origin of Vaccination.

Vaccination may said to have originated from the discoveries made by Dr. Jenner in his inves-

tigations of cases of farm servants who were afflicted with sores upon the hands and arms from milking cows infected with sores about the udder and teats. The first case which attracted his notice was in the year 1770, at Berkeley, in Gloucestershire. A man servant had been attending some horses afflicted with a disease known to veterinary surgeons as the grease; at the same time he was engaged milking some cows upon the farm, and therewith the cows became infected with pustular eruptions upon the udders and teats; from these pustules sores formed, and therewith the man became affected with sores on his hands, accompanied by constitutional disturbance, involving sympathetic enlargement and tenderness of the axillary glands.

Twenty-five years afterwards the man and his family were inoculated with smallpox lymph; the man escaped, the rest of the family took the smallpox, and he nursed them and received no injury from the contagion.

The first case of vaccination was performed by Dr. Jenner on the 14th day of May, 1796, upon a boy eight years of age, who took well and was subsequently inoculated with smallpox matter but did not take it.

In Dr. Jenner's work, published in 1801, third edition are recorded many cases of interest con-

cerning the protective value of the cowpox against smallpox, many of them his own personal observations, and many sent to him by other practitioners, who during the last twenty years of the eighteenth century directed their attention to the subject. The progress of vaccination from that time to this has been slow but sure, and although first discovered in this country has been handled with considerable dexterity and strictness in other countries, of which, perhaps, Germany stands first.

Reasons for Enforcing Vaccination.

The statistical records of all public institutions which have had to deal with smallpox being so markedly similar in their information as to the preventative and palliative value of vaccination.

The fact that in instances where large numbers of persons are assembled together in their daily avocations, such as schools, asylums, hospitals, factories, workhouses, prisons, Government offices, regiments, garrisons, etc., the effects of smallpox among those unvaccinated and those vaccinated have been so disproportionately delineated in favour of the latter; that, acting upon the advice of the most eminent of the medical profession and of others of thought, knowledge, and erudition, the Act of Parliament was passed in the year 1853,

which made vaccination a compulsory law, with the sole object of protecting each individual in particular and the public at large from the scourge of smallpox. That the protective influence does exist is exemplified in every instance in which smallpox inflicts us with its presence; indeed, the known value of its prophylactic virtue would be the most solid argument the anti-vaccinating section of the public could bring forward as to the expediency of the vaccination laws being compulsory.

AGE AT WHICH VACCINATION SHOULD BE PERFORMED.

The age at which vaccination should be performed as a primary operation, is between the second and fourth month of infancy; most infants have by that time got over the thrush and red-gum, to which they are liable, and the complications which are consequent upon dental development are not yet present. Some infants are, however, in advance of their age in this respect, some being born with one or more teeth through the gums; later than the fourth month these complications may be expected, and in addition, they become more sensitive to external impressions, more irritable in their tempers, consequently less easily managed. If the vaccination

be delayed until later than the sixth month the disturbances occasioned by it render the whole period often troublesome to the parent.

Examination of Children.

Before vaccinating any child, it should be examined. The chief points to direct attention to are the skin, mouth, and anus. By carefully looking over a child you ascertain the presence or absence of eruptions, either constitutional, such as syphilis, or acquired, such as roseola, lichen, scall-head, or a may-be combination, as in intertrigo, where a syphilitic trace may be diagnosed. The state of the glandular system can be learnt, as also deformities and injuries. Examination of the mouth reveals the presence of thrush or follicular stomatitis; by examination of the anus information is obtained as to syphilitic eruption or thrush; these points must be attended to, as influencing the constitutional disturbance occasioned by the operation.

Many children who are weaned, or being weaned, may exhibit rashes upon the skin; urticaria and roseola being common, as also lichen. Improper feeding, again, may be productive of cutaneous eruption; irritation of the intestinal canal being an important factor in augmenting any febrile symptoms.

In all cases where substantial benefit may be derived by a few weeks' delay for the child to undergo treatment for cutaneous eruptions, intertrigoid ulcers, gastric derangement, or dentition accompanied by febrile symptoms, it is better to postpone the operation for the time than to be at the risk of aggravating the condition.

As most complications occur after the age of four months, it points strongly to the operation being performed earlier than that. Many postponements are asked for on frivolous grounds, more from mere sentiment than aught else, and should be, with all due respect, discouraged.

Equally important is the examination of the vaccinifer, *i.e.* the child from whom the lymph is taken. Its condition should be well noted in case of complications, as when persons have their children vaccinated against their inclination, any slight excuse they can find they will readily avail themselves of in order to ventilate their grievance. Children who have even a suspicion of syphilitic taint about them should never be vaccinated from; nor should lymph be taken from those suffering from tuberculosis, pustular eruptions, squamous eruptions, rickets, intertrigo, or of strumous diathesis.

It is far better to wait until you get some

reliable lymph than run the risk of any untoward event. At the same time, the opportunity presents itself of noticing the condition of the parent, and of asking a few questions as to general health of the family; what deaths have occurred, and at what ages; also as to miscarriages. Thus taking all precaution to ascertain the health of the child as far as you are able.

Selection of Vesicle.

In the selection of the vesicle from which to obtain your lymph great judgment is required to be exercised. It does not do to take any child and vaccinate forthwith from it. After careful examination, and conscientiously believing the child to be healthy, you select a vesicle that is of eight days' growth, *i.e.* on the eighth day from the vaccination. The vesicle should appear well raised from the skin, edges well up and shiny, an indication of the lymph being free; there should be little areola around it and it should be free from any yellow tint or tendency thereto. An abraded vesicle should not be used, nor should any lymph be used which is not clear and free from blood. A fair-sized vesicle measures one-sixth of an inch in diameter.

The Operation.

In order to vaccinate you require—the subject

to be operated on, a supply of healthy lymph from a vesicle on the eighth day of its growth, an instrument with which to effect solution of continuity in the skin of the subject and with which to apply the lymph, a glass of clean water and a clean piece of linen. Three chairs—one for yourself, which should be rotatory, and one each for the persons holding the infants. The vaccinifer, *i.e.* the child from whom you take the lymph, should be on your left, and the child to be vaccinated in front of you. When the operation is completed, the child should be taken away and another brought into its place. Every man who has many vaccinations to perform finds it necessary to adopt a method to avoid the jostling of persons, as it may happen that a sweep of a shawl or other garment may wipe off all your lymph at one stroke. Both the children should have their arms bare, as any loose straps invariably get in the way. The bonnets should be removed, as the curtains attached to them are generally of sufficient length to wipe off the lymph when the head is rotated. The arm selected to be operated on should be that which is away from the mother during suckling. The best method of vaccinating is from arm to arm, *i.e.* by tapping the vesicle of one child and forthwith inserting the lymph into the arm of the other; it is the most reliable.

By taking a needle and pricking the vesicle, and then with the wet point pricking the arm of the child to be vaccinated, you will produce a vesicle in eight days possessing all the characters of the one from which you took the lymph, but probably much smaller; thus it appears ridiculously simple, but with all apparent simplicity there is a very great amount of knack to be acquired in this operation.

Tapping the Vesicle.—With the point of a thin lancet gently prick around the edge of the vesicle on its upper part; be very careful not to go too deep, as blood may follow, which spoils the lymph and renders the vesicle valueless. After puncturing wait a few seconds and watch the lymph exude; it will come up as a small clear drop through the punctures and finally coalesce on the surface of the vesicle, sometimes, if profuse, even running over on to the skin; touch the lymph with both sides of the point of your lancet, thus charging it; with your hand take hold of the arm of the child you are to operate upon, just below the insertion of the deltoid muscle in such a manner that, while with the thumb on one side and the first two fingers on the other you can gently put tension on the skin, you can with the last two fingers prevent the forearm from being suddenly raised; with the charged point of your

lancet make a light cut in the skin about one-sixth of an inch long, just over the centre of the insertion of the deltoid muscle, then make two or three similar cuts in the immediate locality not above the first, and no two to be within half-an-inch of each other—these cuts are not to be made as if cutting into an abscess, but are between a cut and a scratch; they can be made very quickly and must be done very lightly, so as not to draw much blood, as that frequently washes out the lymph and annoys the parent; the less the quantity of blood drawn the better; now touch gently the cut surface with the sides of the point of your lancet and you have finished.

The particular part thus selected in which to puncture is on account of there being less muscular action going on there than in others, and consequently less disturbance of the skin. Avoid making a cut in a fold of skin, as vesicular development may be disturbed by friction, or in the scabbing stage the scab may be prematurely dislocated and cicatrisation retarded. The child should be allowed to rest a few minutes before being dressed, in order that the cut parts may dry. Immediately after the operation dip your lancet into the water and wipe it on a piece of clean linen, thus ensuring a clean lancet, and avoiding contamination of your lymph. After once charging

your lancet never dip it in the lymph again before cleansing it; too much care cannot be exercised in conducting the operation with every precaution as to cleanliness and reducing the risk of contamination to a minimum, as very awkward results may be arrived at by negligence in these particulars.

Vaccinating from Stored Lymph.—The operation is conducted in the same manner with regard to the child to be vaccinated as in cases of arm to arm vaccination. In using the lymph it depends upon the manner in which it is stored.

From Lymph Stored in Tubes.—Break off each end of the tube and gently blow the contents on to a clean smooth surface, such as a piece of glass—the bottom of an inverted wineglass answers very well. The lymph, being liquid, can then be used as if on a vesicle.

From Points.—Lymph stored on points is in a dry state and requires to be moistened by steam before it can be transferred. The lymph thus moistened must be held in apposition to the cut skin for some seconds and the point turned over from time to time to ensure a transfer of sufficient lymph; it is not so satisfactory a method as the former. When vaccination from points was the common practice, a puncture was made in the skin and the point pushed into it and allowed to

remain sticking there for some time; at the present day this appears a painful and unnecessary method. Points are liable to be contaminated with dust during their drying process, and should be eliminated from the stock of appliances of a vaccinator.

From Lymph Stored between Glasses.—When lymph is stored between glasses, the glasses must be separated by steaming them or by forcible sundering; the lymph surface is then moistened and the lymph taken off by a light scraping action of the lancet; this is an awkward method and involves loss of time.

I have just given an outline of how vaccination may be performed with comparative ease and uniform success.

Instruments.—There are many various forms of instruments used for vaccinating, all having the same end in view, and each claiming a superiority for itself. The simplest to effect the purpose is the best, as it is easiest handled and readiest kept clean.

The principal varieties are—the ordinary lancet, prong vaccinator, needles.

The ordinary lancet I prefer, but as not more than one quarter of an inch from the tip is made use of and the rest of the flat steel causes shadow and obscures, I have had it narrowed and fixed into a piece of ivory about an inch and a-half

long and of sufficient thickness to prevent the point touching the surface of a table when laid upon it—this is a cleanly precaution which the tortoiseshell plates ordinarily attached to a lancet do not admit of.

The prong vaccinator is a thin flat piece of steel, pronged like a fork, and intended to produce several parallel scratches at once; this instrument is in favour with many.

The needle combination is formed by several needle points inserted concentrically into a piece of ivory like the shaft of a penholder, and can be used for multiple puncturing or for scratching.

There are other modifications of instruments for vaccination which have been fashioned from time to time, but I would refer those who wish to go into the details of them to the catalogue of an instrument maker.

Some Remarks on the Skin.

Before attempting to consider the various stages through which the vaccine vesicle passes, it must first be necessary to turn one's attention to the anatomy and physiology of the skin. It is foreign to my purpose to reproduce here the chapters on these subjects, which are so ably set out in the current text books of the respective sciences; it is to be presumed that the reader in

his course of study has made himself acquainted with them. That being the case, I would here point out the great differences one meets with in the qualities of the texture of the skin while vaccinating—in some instances the slightest touch will cause blood to flow, in others it only appears after repeated cutting. These differences may be due to natural formation or to the influence of a diseased condition either of a trivial or severe nature. Generally speaking a breast-fed infant can be detected by plump appearance, by feeling the subcutaneous adipose layer of an elastic softness and in abundance, the muscular tissues are obscured in them, the lancet meets with little opposition; if the epidermis be naturally thick it is not tough, especially in fair complexioned infants, where the least scratch is manifest. Children who have been improperly fed usually, in addition to a pinched look, open staring eyes, have the skin loose and hard. I have noticed this in children who have had their milk-bottle filled with too large a proportion of milk to water, and where at times farinaceous food has been administered before the child has the gastric power to digest it. The adipose tissue here is small in quantity, the muscular tissues are plainly felt; when blood appears it is generally of a dark colour. The skin of tubercular

children and those suffering from diseases causing loss of flesh, such as whooping cough, is usually loose, and in the former class hard; in the latter tough but not hard; in some instances with light cutting these hard skins sound as if you were cutting periosteum in the same manner. Strumous children exhibit various conditions of nourishment, but have generally a streaky or patchy shininess upon the skin—chiefly on exposed parts, as face, arms and legs; the skin is usually spongy and the external layer of epidermis easily dislocated, often adhering to the lancet in scratching. In fair children the skin may be very thin and easily bleed, in dark if it be thick it is seldom hard.

In syphilitic children the skin may be like that of the strumous and improperly fed in various degrees.

Growth and Decay of the Vesicle.

An hour after the operation is performed the cut is found to be occluded by a line of crassamentum, and from this time to the middle of the suppurative stage it will remain conspicuous. About twenty-four hours after the operation a slight areola appears on each side of the line; on the third day this is more marked and becomes circular; on the fourth, the centre is elevated into a nodule, which on the fifth becomes larger

and exudation appears at the top, formation of vesicle, areola deeper colour. On the sixth, exudation more marked and extending outwards, the centre becoming depressed; on the seventh, the exudation more extensive and the line seen to be held down—umbilication; edges of vesicle raised; on the eighth the vesicle larger, edges more raised, and appear under tension and shiny, areolæ of the separate vesicles approaching each other; on the ninth day the areolæ often confluent and darker, the vesicle more tense—may even burst, the contents assuming a milky or straw tint. Now is the incipient purulent stage, and day by day the vesicle assumes more of that character, the edges become reddish purple; from the twelfth to fourteenth it becomes a mass of pus, serosity, and cellular *débris*, which forthwith commences to dry up, firstly into a yellow, then yellow-brown, finally into a brown-black scab, button-shaped, which falls off from about the end of the third to the middle of the fourth week, leaving behind a scar proportionate to the size of the vesicle and possessing a marked character. It will thus be seen that the period occupied by these changes is about a month, and may be divided into three stages:—first, vesicular stage; second, purulent stage; third, scabbing stage.

The inflammatory result of the cut is the for-

mation of the umbilication, which from a puncture is small and may even be ruptured, as some vesicles are seen resulting from punctures in which the spot of crassamentum is free on the top of the vesicle, which fills like a bladder. Again, you can determine the size and shape of your vesicle by the manner in which you make your cut. The vesicles are not all alike internally; sometimes you have your vesicle emptied by tapping in one place only—the cellular partition being broken and the fluid collected in a common cavity; others only exude from separate punctures a tiny spot of lymph at each opening, pointing out the compound nature of the vesicle and integrity of the cellular partitions. Occasionally a vesicle of fair appearance yields no lymph on puncturing; it feels pithy as you prick it; these vesicles do not possess a shiny appearance on the edge; minute blood vessels are seen traversing some vesicles, and should be avoided in puncturing; sometimes ecchymotic spots are present. During the pustular stage care must be taken that the pustules be not rubbed and broken, as troublesome inflammation, febrile state and tedious healing of the sores is thus occasioned. The unpleasant appearance of the arm at this time disquiets the parents, and it is well to recommend the morning administration of a

dose of magnesia, or some gentle laxative of a saline nature. I find the dermatitis which surrounds the pustules at this time much relieved by painting with a mixture of linseed oil, glycerine and Goulard's extract. The amount of deep tissue destruction involved in the suppurative stage is very largely dependent on the general health of the child, as the good effects of the remedies used in strumous cases testify.

The scabbing stage is often accompanied with a good deal of itching in the arms, and sometimes children scratch off the scabs; parents should be cautioned of this, as if scabs are allowed to fall off in the usual course the parts subjacent are quite healed.

Scars.—The scars left usually come under three heads. Those resembling a well-pitted crumpet are termed foveated—these are considered the typical scars; glazed scars, which are smooth and shiny, not foveated; rugated scars, ridged and puckered, a consequence of excessive destruction of the cutis; they sometimes resemble the scars of extensive burns. The foveated scars are white, the glazed and rugate scars are occasionally purplish, chiefly white. In taking the value of a scar as indicative of protection, the constitutional influences which may bear upon their formation should not be overlooked.

Insufficient Vaccination.

In some cases out of four or five scratch cuts one or two only may take, and upon the principle that whatever is worth doing is worth doing well, you should vaccinate again, when the child is brought up for inspection, in two more places, not using the lymph from the vesicles which are on the arm. I have found this the case occasionally, and although at first you may meet with a refusal on the part of the parents, there is not much difficulty in carrying it out, especially when the information is advanced that the delay occasioned by the repetition is infinitesimal. Imperfect vaccination is bad and may tend to diminished belief in it, as it certainly diminishes the protective efficacy. Insusceptibility to vaccination is very rare.

Vaccination with Calf Lymph.

Lately it has become amongst some a fashion to vaccinate with lymph which is exuded from vesicles formed upon calves. I have done but very little in this department, but remembering the fact that the primary vaccina took its origin in a totally different manner, I shall await the time until the protective value of this lymph is more fully developed, and rely now upon a system which is known to be valuable and which

risks a minimum of evil if carefully and conscientiously carried out.

Disturbances Occurring After Vaccination.

At times the Public Vaccinator is addressed by the parent of a child who has been vaccinated a week or two before, calling attention to eruptions on the body or head, which are asseverated to be the result of the vaccination, as the child never had a blemish on it before the operation was performed, also informing you that neither she nor any of her family ever had anything the matter with them, and that the child's blood has been poisoned by matter from a diseased child and so forth. This information is not always laid before you in language the most precise, nor accompanied by feelings the most friendly. However, having heard what is said, the first thing to do is to try and find out for yourself what is the matter. During the period from the seventh to the twelfth day, rarely earlier or later, erysipelas may occur, very different in appearance from the hyperæmia which is usually present, and very often before the child is brought to you poultices have been applied, which encourages the coalescence of the pustules, and eventually leaves an ugly rugate scar. Whenever I see excessive hyperæmia on the day of inspection, I invariably

order a cold water application to the arm, to be kept applied two or three hours; this usually cools down the part and the arm does well. Belladonna smeared on the part, if there be erysipelas, seems to answer as well as anything.

Bearing in mind that cutaneous injuries of even a slight nature occurring in persons suffering from gastric irritation or febrile condition, may cause sympathetic enlargement and tenderness in the glands having relation to the part, it is not to be wondered at that one meets now and then with enlargement of the axillary glands after vaccination. Medical practitioners are often consulted by persons engaged in washing, who with an abrasive cut on the finger, have, from the irritant qualities of the soda-water, had pus form in the abraded part accompanied by erysipelas, locally involving the lymphatics of the forearm and sympathetic action in the axillary glands. Erysipelas after vaccination requires treating as if it were the consequence of a scald or burn. Erysipelas is uncommon in breast-fed infants under four months; it generally occurs in those who are troubled with gastric irritation, from improper feeding, or who are suffering from the complications of dental development. We know that gastric irritation frequently produces and is

diagnosed by cutaneous eruptions, as in the cases of persons partaking of pork, mussels, crabs, and other foods; also by certain drugs, such as copaiba, bromide of potassium, and we also know that special ulceration takes place occasionally in the duodenum after a burn. Looking at the connection, it is not difficult to conceive that erysipelas may be excited by internal causes.

There is one form of erysipelas I have noticed which is rare—metastatic erysipelas; it did not affect the child's general health in any way, but kept popping up in a small patch, first in one part, then in another, and lasted about a fortnight. I have also seen creeping erysipelas, travelling from the pustules by successive stages to the hand, where it disappeared. In these cases the febrile condition is marked.

There are many children who only require a stimulus to evolve cutaneous eruptions, and which vaccination occasionally affords, but that does not say that vaccination alone produces it; if that were true it could be the parent of urticaria, roseola, lichen, herpes, and of all other eruptions to which children are liable. But a rash may follow an immersion in cold water, as, indeed, frequently happens.

It would be possible, no doubt, to produce a very inflammatory state of the arm—metastatic

abscess—great nervous depression with much fever, by vaccinating from a vesicle which had run into the pustular stage, or from lymph mixed with blood, in which instance systemic disease might be communicated, but my purpose is served by pointing out how to avoid such events, and to notice some disturbances which occur after the use of lymph taken from a vesicle such as described in the paragraph on the selection of the vesicle.

Lichenous papules are more frequent than other eruptions after vaccination, and soon succumb to an alkaline laxative treatment; they may be present until the scabbing stage is completed; children are often suffering from them when brought to be vaccinated.

Scalp Eruptions are the frequent cause of postponement of vaccination, and it is well that they should be seen by others than the parent, pointing out to them that these affections pre-exist to vaccination, and it goes a long way to remove a prejudice. When these eruptions appear after vaccination, they are frequently put down as the direct result, and as they are unsightly, these unfavourable impressions are the more readily conceived.

Eczema is again a tedious disease, which is often the cause of postponement, and after the comparative recovery from it, a fresh attack may be

developed after vaccination. I have had varicella occurring a month after vaccination, attributed solely to vaccination. Scabies in the same manner, and even bronchitis.

Diarrhœa is a not uncommon complication, and where the arm is at all inflamed, if it be present in moderation, it is a healthy action, and relieves the child. In infants under four months a very mild antacid astringent will check it. In children over four months it is well to ascertain the condition of dental development, as diarrhœa is one of the most constant attendants upon dentition. In all cases of cutaneous eruption direct attention to the internal economy, ascertain the precise nature of the food given, and which requires often repeated questioning, as persons cannot always at a moment's notice detail what a child, say seven months old, takes in the course of twenty-four hours.

Weaning is often productive of gastric derangement, which reacts on the skin, producing urticaria, which may be prolonged during the vaccination period. There is a form of eruption which occasionally presents itself during the vesicular stage; it first appears as a red spot, in the centre of which a white spot appears, the day after a small vesicle will be formed in some of them, occupying the position of the white spot;

it is never umbilicated, it does not run into the purulent stage, but dries up in about three days; the duration of the eruption is about five days, the vesicles are flat, and do not rise up above the papular margin; when they appear between the heel and ball of the great toe they are apt to be rubbed and get irritable.

The local disturbances are most frequently the result of violence; the vesicles may be rubbed, perhaps by friction against the mother's dress during suckling, from rubbing against the bed-clothes, or from tight shoulder straps, very frequently through the negligence of the nurse-girl. Pustules may be rubbed in like manner, or a scab may be dislocated by the child scratching it; in any stage one or more of the places may be disturbed and inflammatory results produced. Sometimes a vesicle or pustule may burst from over tension; cold water applications are far better than poultices, and stave off inflammation. If the stage of cicatrisation be prolonged it is generally in those of strumous diathesis, and cod liver oil with steel wine advances it; very weak astringent lotions assist; if there be irritation, cold water externally and saline laxatives internally do good.

Storage of Lymph.

Lymph is frequently collected from vesicles and

stored for purposes of convenience and to keep up a reserve supply. The methods of storage are chiefly in capillary tubes, on ivory points, between glass plates; of these methods the capillary tube storage is the best. The tubes are of fine white glass about 3½ inches in length, and are of various calibres. As a guide to calibre, I find by experiment that a capillary tube 3½ inches long, when two-thirds full of lymph, contains one-third of a minim; that is ample to vaccinate four children with. It is extremely rare to find a bundle of tubes uniform in calibre; I am in the habit of using Husband's tubes as the best I know of now; some of these are very large and have a capacity of containing enough lymph to vaccinate eight children with. Two or three sizes should be at hand to suit individual purposes, for it would be wasteful to supply a medical man who wishes to vaccinate one child only, with a tube of lymph capable of vaccinating half-a-dozen.

The method of charging the tube is as follows: Selecting a tube of the capacity you require, and seeing that it is free from *débris* of broken glass and dust, you hold your tube slantingly, and applying one end to the pool of lymph which is on the vesicle you have previously tapped, by lightly holding it there you will find the lymph quickly run up, and when two-thirds full you

take it away and gravitate the lymph to the centre of the tube—by a gentle tap in small tubes or even by slanting a large one—you then place one end so as to touch the flame either of a gas jet or taper, and keep it there for a few seconds, and rotating the tube at the same time you thus hermetically seal the end by fusion, and the rotating movement prevents the end curling or bulbs forming. You then serve the other end in the same manner and then place your sealed tube in a place of safety, duly labelled with the date of its being taken and a reference to the child whence taken.

On Points.—To store lymph on points you require a number of thin ivory slips with pointed ends, these are dipped into the pool of lymph, touching each side of the pointed end, and then placed on a book or piece of wood, so that the points are free, and allowed to dry. They are then packed in paper slips and duly labelled and recorded as in case of tubes.

Between Glasses.—You require two pieces of clean glass, each about an inch square, see that they are free from dust or perspiration from handling, apply very lightly one surface to the lymph, touching it in two or three places, do the same with the other piece of glass, and then place the lymphy surfaces together and press lightly. They

thus adhere and are packed in paper wrappers and duly labelled and recorded.

A vaccine bottle is sometimes used, which consists of a white glass bottle about an inch and a-half in height, fitted with a stopper, which is prolonged in a flattened form nearly to the bottom of the bottle. To charge this you draw out the stopper and touching the lymph with both sides of it replace it. In all cases of storing—by points, glasses, or bottle—do not press the vesicle.

Whenever lymph ceases to exude from a vesicle never squeeze it or press it; if you do you may contaminate your lymph with blood or other matter which may occasion mischief.

In cases where a practitioner has to vaccinate a child at a short distance from his house, he may frequently charge his lancet only and then go and vaccinate, and this usually meets with success.

Vaccinating on Nævi.

Vaccination has been performed upon nævi in many instances with a view to their destruction. As a rule nævi, whose areage does not exceed that of a square half-inch, may be readily occluded by vaccinating in four or five places round the edge of the nævus, the scar that remains being usually puckered. Nævi of larger dimensions do not so readily yield to this treatment,

especially by one operation, and would be better treated by other methods. I have not been able to ascertain whether smallpox has occurred in patients after vaccination upon nævi.

Re-Vaccination.

Re-vaccination is not compulsory by law, but many large employers of labour have made it a *sine quâ non* that, every candidate for admission to their establishment must produce a certificate of recent re-vaccination. This is a step in the right direction, and is a strong common sense appeal, and as it is becoming more general there is no doubt that the immunity offered by re-vaccination will be more than ever convincing. One of the chief reasons that may be adduced in favour of a second vaccination is that there is a possibility of infants, although certified to in the ordinary form of having been vaccinated, may yet have had that operation imperfectly performed, or as the cicatrices on the arms bear witness, that it has been more or less unsuccessful.

Again, on the assumption that the potential energy of the vaccine prophylactic may be decreased as years roll on, it is reasonable to conclude that a reinforcement of that energy would be beneficial. Young persons, however, above the age of puberty and who then commence to

assert their independence, do not choose, unless under the panic influence of an epidemic, or of the necessity of undergoing such an ordeal prior to their getting an employment, to be re-vaccinated. I am speaking as a rule; of course there are exceptions. But as a matter of fact the temporary three weeks' inconvenience undergone by the operation is nothing comparable to the almost entire protection from a foul scourge.

Re-vaccination should be always performed with the lymph taken from a primary vesicle; lymph taken from a secondary vaccination may be pure but there are influences which the ordinary life of the adult may cause to react upon the system and render the use of re-vaccinate lymph inadmissible. During the extensive epidemic of 1871 I re-vaccinated several senior members of a family, by their expressed wish, from a junior member who had been re-vaccinated and with perfect success as far as the formation of the vesicles went, but as to the protective value of the operation I can say nothing, save that I have not heard of any of them being attacked with variola. In the majority of these cases I was allowed to take plaster casts from their arms, and from them I made wax models which I coloured as near the originals as I could; these I now possess. One case I have photographed, which was that of a young girl who had had smallpox recently and who

was re-vaccinated with re-vaccinate lymph and took well.

In such cases in private practice where the expressed desire of the persons concerned is made manifest, I see no exception to be taken, but as a matter of usual practice do not vaccinate with lymph taken from a secondary vesicle.

Age for Re-Vaccination.—With regard to the age at which the second operation should be performed, it has been publicly given out as fourteen years and upwards, except during epidemics, when the age is reduced to twelve years.

From a record of cases I made during the epidemic of 1876, and which was published in the *Lancet* of October 14th, 1876, I had reason to observe that re-vaccination might be performed with every advantage at a much earlier age, and subsequent experience confirms my opinion then expressed. The period at which I would recommend re-vaccination is at the commencement of the second dental development. Nature then points out to us our entry upon a second phase of our existence, when the milk teeth which have been the weapons of mastication in our younger childhood are being replaced by others of a more powerful calibre and more lasting material; it is the period to which the future growth and strength of the individual may be referred; it is the period at which the fewest deaths occur from

ordinary causes, and may be considered the period of solidity of growth. It is at this time I would recommend the performance of re-vaccination as likely to be most permanent in its effects. Being the time at which the mass of the child population is at school, it would offer every opportunity for the prevention of epidemic variola.

Operation.—The operation is performed as in primary vaccination, with this exception, that the cuts should be made not less than one inch from each other, as the tendency to inflammatory areola is greater than in primary cases. Three cuts are usually sufficient.

Change in Vesicle.—You must not expect to find a complete vesicle formed in every case of re-vaccination; if you do it is satisfactory, pointing out that you have a capital safeguard against the smallpox, and which only existed in a lesser degree prior to the second operation. Most frequently the result is the formation of a nodule with areola, this nodule may have a small quantity of fluid at the top, close to where the puncture was made, or perhaps none; occasionally infiltration with areola is the sole result.

Vaccination Stations.

In order to facilitate the carrying out of the provisions of the Act rendering vaccination compulsory, the Guardians of the different Parishes

and Unions have been required to provide certain places where the public may attend and have the operation performed free of charge; some of these places consist of rooms at private houses, some at public institutions, such as chapels, schoolrooms, and the like, very few are provided solely for the purpose. As the majority of the applicants to a public vaccination station are of the humbler classes of persons, it is the more imperative that these stations should be roomy, well-ventilated, kept thoroughly clean, and furnished for the purpose in a fit and not necessarily expensive manner. The impression produced upon the mind of an applicant upon entering a dingy, dirty room, with makeshift furniture and with a morose attendant, who may or not be clad in workhouse attire, is not favourable, and as the great social importance of the subject is becoming more extensively understood, attention should be directed to keeping up the rooms in which the public are invited to wait in, and to be operated upon in, with due regard to character. Vaccination stations should be so placed within the Parish or Union that they are easy of access to all persons within the district they are intended for.

Vaccination Officers.

Vaccination Officers are, and have been for some time, appointed to carry out the provisions

of the Act, by ascertaining from the books of the local Registrar the births and deaths of infants, and seeing that the vaccination certificates are duly returned and recorded; to serve them with notices whose time allowed has been outrun, and in the event of their non-compliance with the notices, to take such steps as may be directed by the Guardians to enforce the law which bears upon the subject. Removals of children soon after birth from one district to another involves correspondence between the officers of the respective districts, in order that the Act may not be evaded. He has further to make personal calls upon parents, often being soundly abused by those who object to vaccination, as though he had been the promoter of the Act of Parliament. Besides the exercise of physical action in his daily rounds, the officer has a great deal of mental exercise in his searches through the books and mapping out his plans, and the two combined in a vast amount of clerical work appertaining to the office and official reports. He assists the Public Vaccinator at his station, and if he be firm, but gentlemanly in his manner of dealing with his cases, he is very successful and indispensable to the proper carrying out of the Act.